

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
26 July 2007 (26.07.2007)

PCT

(10) International Publication Number  
**WO 2007/083998 A1**

(51) International Patent Classification:  
A01K 5/00 (2006.01) B01F 7/24 (2006.01)

(21) International Application Number:  
PCT/NL2007/050015

(22) International Filing Date: 15 January 2007 (15.01.2007)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:  
1030925 17 January 2006 (17.01.2006) NL  
2000187 17 August 2006 (17.08.2006) NL

(71) Applicant and  
(72) Inventor: LIET, Cornelis Hendricus [NL/NL];  
Denekampdijk 38, NL-7581 TJ Losser (NL).

(74) Agent: DE VRIES, Johannes Hendrik Fokke; Over-  
schiestraat 180, NL-1062 XK Amsterdam (NL).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AF, AG, AI, AM,

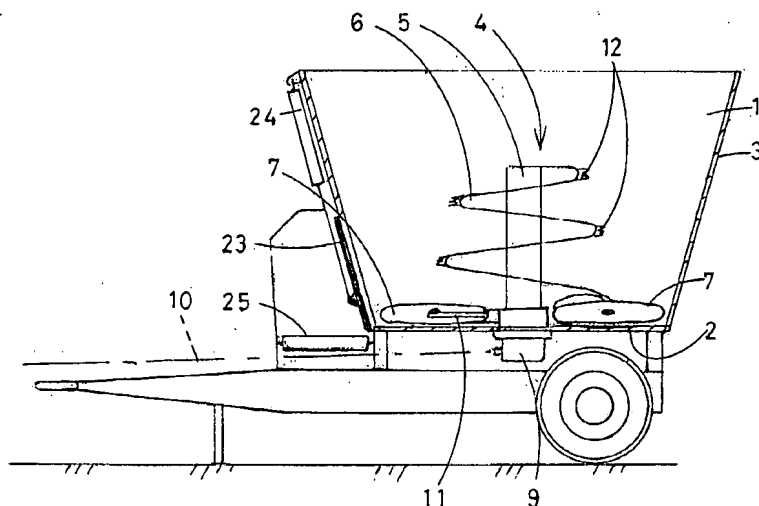
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS,  
JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS,  
LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY,  
MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS,  
RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,  
RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS FOR PROCESSING MATERIAL, SUCH AS A BIOMASS OR FEED FOR CATTLE



(57) Abstract: An apparatus for processing material, such as a biomass or fodder for cattle, comprises a container (1) having a bottom (2) and an upright wall (3), and at least one mixing element (4) comprising an upright column (5) and a mixing blade (6) attached to the column. A front edge of the mixing element at least substantially joins the bottom of the container. The mixing element with its column is rotatably mounted in the container and can be coupled to a drive unit. The mixing blade comprises an element (7) which is rotatably supported on a carrier that is fixed to the column. A part of the circumferential edge of the rotatable element may form the front edge and the part of the outer edge of the mixing blade that joins said front edge.

WO 2007/083998 A1

Apparatus for processing material, such as a biomass or feed for cattle

The invention relates to an apparatus for processing material, such as a biomass or fodder for cattle, comprising a container having a bottom and an upright wall, and at least one mixing element comprising an upright column  
5 and a mixing blade attached to the column, a front edge of which at least substantially joins the bottom of the container, which mixing element is rotatably mounted in the container.

Such an apparatus and mixing element are known, for  
10 example from EP-A-0 943 236. A problem that occurs with the known apparatus is that the front edge and the adjoining part of the outer edge of the mixing blade push up the fodder that is present in the container during rotation of the mixing  
15 element, with the fodder sliding over the bottom of the container instead of moving upwards over the mixing blade. This results in a reduced mixing action of the mixing element. In addition, the mixing element is usually provided with knives along the outer edge of the mixing blade for cutting the fodder. To obtain an optimum cutting action, the difference in  
20 speed between the fodder and the rotating mixing element must be as great as possible. If the fodder is carried along at substantially the same speed by the mixing element, the cutting action will be minimal. The cutting efficiency of the known apparatus is low, and a high power level is required  
25 for reducing the fodder to a sufficient extent.

The object of the invention is to provide an apparatus and an mixing element of the above kind, which provide an improved cutting action and mixing action.

In order to accomplish that object, the apparatus  
30 is according to the invention characterised in that the mixing blade comprises an element which is rotatably supported on a carrier that is fixed to the column.

In this way an apparatus is obtained wherein the rotatable element significantly reduces the friction between the fodder and mixing blade, so that a considerable energy-saving is realised upon processing the fodder. Furthermore, the discharge of the feed mixture via the delivery opening in the wall of the container is improved in that more radially directed forces are exerted on the fodder. In addition, a comparatively large difference in speed is realised between the fodder and the rotating mixing element, as a result of which the cutting action of the mixing element is significantly improved.

According to an advantageous embodiment, the rotatable element is disposed in the lower half, preferably in the lower third part of the mixing blade.

According to one embodiment, the rotatable element is disposed at the beginning of the mixing blade near the bottom of the container, wherein a part of the circumferential edge of the rotatable element forms the front edge and the part of the outer edge of the mixing blade that joins said front edge. The rotatable element forms the entry part of the mixing blade, as a result of which the fodder is picked up, as it were, and placed on the adjoining part of the mixing blade or, if more than one rotatable element is used, on the next rotatable element. In this way the feed-in of the fodder into the mixing blade is improved.

The invention also provides a mixing element comprising an upright column and a mixing blade having a front edge and an outer edge, which is attached to the column. Said mixing element is according to the invention characterised in that the mixing blade is provided with an element that is rotatably supported on the mixing blade.

The invention will be explained in more detail hereinafter with reference to the drawing, which shows a few very schematic views of embodiments of the apparatus according to the invention.

Fig. 1 is a schematic side elevation, partially in sectional view, of an embodiment of the apparatus according to the invention.

Fig. 2 shows the container of the apparatus of figure 1, partially in sectional view, which is provided with a mixing element according to one embodiment of the invention.

Fig. 3 shows a part of a horizontal sectional view  
5 of the container of Fig. 2.

Fig. 4 is a schematic plan view of the container of a second embodiment of the apparatus according to the invention, which is fitted with two mixing elements.

Fig. 5 is a horizontal sectional view corresponding  
10 to Fig. 3 of a variant of the apparatus according to the invention.

Fig. 6 is a horizontal sectional view corresponding to Fig. 5 of another variant of the apparatus according to the invention.

Fig. 7 shows a part of a sectional view of an embodiment of the apparatus according to the invention in which a variant of the mixing element is used.  
15

Fig. 1 very schematically shows an apparatus for processing fodder for cattle, which comprises a container 1 having a bottom 2 and an upright wall 3. The apparatus is  
20 also suitable for processing other materials, such as a biomass. Mounted in the container 1 is a mixing element 4 comprising an upright column 5 and a helically extending mixing blade 6 that is attached to the column. The container and  
25 the mixing element 4 are shown in more detail in Fig. 2, which clearly shows that the entry part of the helical mixing blade 6 is formed by a disc 7 that is rotatably supported on the mixing blade. It is noted that also differently configured rotatable elements may be used. The diameter of the disc  
30 7 or the radial dimension of a rotatable element corresponds at least substantially to the radial dimension of the mixing blade. As a result, the surface of the mixing blade 6 at the location of a disc 7 is substantially formed by the surface of the disc.

A part of the circumferential edge of the disc 7  
35 forms the front edge and the part of the outer edge of the mixing blade 6 that joins said front edge. The lowermost part of the circumference of the disc 7 is indicated at 8 in Fig.

3. As is shown in Fig. 2, the disc 7 is supported on the mixing blade 6 in such a manner that the part 8 is spaced a small distance from the bottom 2 of the container 1, whilst the opposite arcuate part of the disc 7 is positioned higher.  
5 Alternatively, the disc 7 may extend substantially horizontally.

The mixing element 4 is mounted in the container 1, its column 5 being rotatable about an axis that extends upwards from the bottom of the container (indicated at 5A in  
10 Fig. 3), and can be coupled to a drive unit 9, which can be driven from the power take-off shaft of a tractor (not shown), as is schematically indicated by a dashed line 10 in Fig. 1. It is noted that it is of course also possible to use other constructions for rotatably and drivably supporting the  
15 mixing element in the container 1.

In the embodiment that is shown in Figs. 1-3, the mixing element 4 is provided with a mixing arm 11, which projects from the column 5 approximately diametrically opposite the disc 7, on which arm 11 a disc 7 is likewise rotatably  
20 supported. Also in the case of this mixing arm 11, a part of the circumferential edge of the disc 7 forms the front edge and the outer edge of the mixing arm 11, and the disc 7 extends obliquely upwards. The disc 7 of the mixing arm 11 may also extend substantially horizontally.

25 In Figs. 1 and 2 the mixing blade 6 is provided with a number of knife elements 12, which are fixed to the mixing blade 6 and which project from said mixing blade.

The discs 7 have a bevelled circumferential part 13, on which carrier elements 14 are mounted, which enable a  
30 better engagement of the disc 7 on the fodder to be processed. The disc or discs 7 may also have a sharp outer circumferential edge, so that the discs can act as knives. The discs 7 of the embodiments described herein are flat. Alternatively, the discs may also be slightly spherical or  
35 conical in shape.

Seen in the direction of rotation of the mixing element 4, which direction is indicated by an arrow 15 in Fig. 3, a guide plate 16 is disposed in front of the disc 7

of the mixing blade 6, which guide plate is fixed to the column and which extends in substantially radially outward direction. The guide plate 16 carries the fodder from the central part towards the outer side, so that the fodder can be picked up by the disc 7. The guide plate 16 at least substantially joins the circumference of the disc 7 with an arcuate edge thereof.

Fig. 5 is a sectional view corresponding to Fig. 3 of an embodiment of the apparatus according to the invention, which is configured in substantially the same manner as the apparatus that is shown in Figs. 1-3. In this embodiment, a scraper element 26 is provided at the rear side of the disc 7. Said scraper or stripper element removes any fodder that may be carried along by the circumference of the disc 7, so that the disc will remain free from fodder and will continue to be freely rotatable. As is illustrated in a dashed line, the disc 7 is rotatably supported on an arm 27, which is connected to the column 5.

In the embodiment that is shown in Figs. 1-3, a second disc 17 is mounted to the mixing blade 7, which disc 17 is positioned partially below the disc 7. This means that in this embodiment the disc 7 transfers the fodder to the second disc 17, which in turn transfers the fodder to the mixing blade 6. As Fig. 3 furthermore shows, a pusher element 18 is mounted on the shaft of the disc 17. Said pusher element 18 is fixedly connected to said shaft and consequently it is stationary with respect to the rotatable disc. This facilitates the transfer of the fodder from the disc 17 to the mixing blade 6.

In the embodiment that is shown in Fig. 5, the second disc 17 is incorporated in the mixing blade 6, so that the surface of the disc 17 at least partially coincides with the surface of the mixing blade 6.

Fig. 6 is a sectional view corresponding to Fig. 5 of an apparatus according to the invention, in which the arm 27 carries another scraper 28. The free end of the scraper 28 is positioned closer to the wall 3 of the container 1 than the circumference of the disc 7. The scraper 28 guides fodder

that lands between the disc 7 and the wall 3 or under the disc 7 in the direction of the column 5, so that said fodder is reintroduced into the mixing process. The scraper 28 preferably extends at an angle to the wall 3.

Fig. 7 shows an embodiment of the apparatus according to the invention in which a second helical mixing blade 29 joins the mixing arm 11 that carries the second disc 7. The second disc 7 may in this case also be mounted to the second mixing blade 29 itself, of course. The second mixing blade 29 extends over a length of, for example, at least 180°. The fodder is picked up by the second disc 7 and placed on the mixing blade 29, which subsequently deposits the fodder on the mixing blade 6 and the disc 7. This results in an improved mixing action of the mixing element.

Using the present apparatus, one or more bales of fodder, such as grass silage and any other types of fodder, is (are) deposited into the container 1, after which the mixing element 4 is driven to rotate in the direction indicated by the arrow 15. The friction between the discs 7 and the fodder causes the discs 7, 17 to rotate in the direction indicated by the arrows 19. As a result, the sufficiently reduced fodder is easily picked up by the lowermost part 8 of the discs 7 and delivered to the next disc 17 or, in the absence thereof, to the mixing blade 6. This facilitates the introduction of the fodder into the helical mixing blade 6. In addition, the fodder that is present in the container 1 is at least substantially stationary with respect to the rotating mixing element 4, as a result of which the knife elements 12 cut relatively quickly through the fodder in the container. In this way the cutting action of the mixing element 4 is significantly improved. The cutting efficiency of the present apparatus is high, as a result of which a considerable energy saving in the processing of the fodder is realised.

Fig. 4 shows a plan view of a container 20 of a second embodiment of the apparatus according to the invention, which comprises two mixing elements 21. Said mixing elements 21 are configured in the same manner as the above-

described mixing element 4. As this plan view shows, the paths of the discs 7 overlap in the hatched part 22. When the discs 7 move through this part 22 during the mixing of the fodder in the container 20, they deposit part of the picked-upper fodder behind the disc 7 in this part, where it can be picked up by the disc 7 of the other mixing elements 21. This leads to a significantly improved mixing action of the mixing elements 21 in the longitudinal direction of the container 20.

In the embodiment that is shown in Fig. 1, the container 1 is provided with a metering flap 23, which can be opened by means of an actuating element 24. The metering flap 23 closes the delivery opening (not shown) in the wall 3 of the container, so that the fodder is discharged from the container 1 in the open position of the metering flap 23 and delivered to a cross conveyor 25. The fodder is discharged from the container 1 by the rotation of the mixing element 4. The discs 7, 17 may be decelerated or be stopped entirely to enable removal of the fodder from the container 1. Means (not shown) are provided for this purpose. It is also possible to activate the means for decelerating or stopping the disc or discs 7, 17 for the purpose of removing the last part of the fodder from the container 1.

In one variant (not shown), the wall 3 of the container 1 may also be provided on one side or on both sides with a delivery opening fitted with a metering flap, so that a cross conveyor is not needed. Experiments carried out with the apparatuses described herein showed that the delivery of the feed mixture takes place substantially in radial direction relative to the direction of rotation of the mixing element, as a result of which an even and correctly metered delivery of the feed mixture is possible. With the known apparatus, which has a mixing element not provided with discs, the direction of movement of the feed mixture is substantially tangential relative to the direction of rotation of the mixing element, which has a slightly inhibiting effect on the delivery.



Alternatively, a rotatable element, such as the rotatable disc 7, may be disposed in the lower half, more in particular in the third part of the mixing blade 6 that joins the bottom of the container. This part of the mixing blade 6 is the most operative part in the delivery of fodder via the delivery opening, so that the metered delivery is improved also when using a mixing blade 6 fitted with a rotatable disc 7 that is present in this operative part. Moreover, a rotatable element in the mixing blade helps to reduce the friction between the fodder and the mixing blade at any position, with the attendant advantages of an improved cutting action and an improved efficiency.

It is noted that in the embodiment of the apparatus and the mixing element according to the invention as described herein the mixing element 6 functions as a carrier for two partially overlapping discs 7 and 17. It is also possible to use more of such discs, of course, and the discs may also be arranged side by side. One or more discs may be incorporated in the mixing blade, as is shown in figure 5 for the disc 17. The radial dimension of one or more discs substantially corresponds to the radial dimension of the mixing blade. This radial dimension of the discs amounts to at least half or more of the radial dimension of the mixing blade at the location of the disc. To reduce the friction between the mixing blade/mixing blades and the feed mixture, the/each mixing blade may be provided with a smooth coating, for example teflon.

Furthermore it is possible to use a helically bent rod or beam as the carrier attached to the column 5 instead of the mixing blade 6, or to use a number of separate supporting arms attached to the column for overlapping, rotatable discs. It is also possible to provide the or each disc with one or more knives at the circumference thereof.

The invention is not restricted to the embodiment as described in the foregoing, which can be varied in various ways within the scope of the invention as defined in the claims.

## CLAIMS

1. An apparatus for processing material, such as a biomass or fodder for cattle, comprising a container having a bottom and an upright wall, and at least one mixing element comprising an upright column and a mixing blade attached to  
5 the column, a front edge of which at least substantially joins the bottom of the container, which mixing element is rotatably mounted in the container, characterised in that the mixing blade comprises at least one element which is rotatably supported on a carrier that is fixed to the column.
- 10 2. An apparatus according to claim 1, wherein the rotatable element is disposed in the lower half, preferably in the lower third part, of the mixing blade.
3. An apparatus according to claim 2, wherein the rotatable element is disposed at the beginning of the mixing  
15 blade near the bottom of the container, wherein a part of the circumferential edge of the rotatable element forms the front edge and the part of the outer edge of the mixing blade that joins said front edge.
4. An apparatus according to any one of the claims  
20 1-3, wherein the rotatable element is supported on the carrier in such a manner that the part of the element opposite the front edge is positioned higher.
5. An apparatus according to any one of the claims  
25 1-3, wherein the rotatable element is arranged substantially horizontally.
6. An apparatus according to any one of the preceding claims, wherein the rotatable element is configured as a disc that is rotatable about its axis.
7. An apparatus according to claim 6, wherein a  
30 circumferential part of the disc is bevelled, which circumferential part may be provided with a number of circumferentially distributed carrier elements.
8. An apparatus according to claim 6 or 7, wherein each disc has a sharp outer circumferential edge.
- 35 9. An apparatus according to claim 6, 7 or 8, wherein a stationary pusher element is mounted to the shaft

of the disc, which pusher element projects from the upper surface of the disc and extends in the direction of the outer circumference thereof.

10. An apparatus according to any one of the preceding claims, wherein the/each rotatable element is provided with one or more knives at the outer circumference thereof.

11. An apparatus according to any one of the preceding claims, wherein the column of the mixing element is provided with a guide plate near the front edge of the mixing blade, which guide plate extends in substantially radially outward direction and which preferably has an arcuate edge at the side that joins the disc.

12. An apparatus according to any one of the preceding claims, wherein the column of the mixing element is provided with a scraper element at the rear side of the first rotatable element, which element extends in substantially radially outward direction.

13. An apparatus according to any one of the preceding claims, wherein the mixing element is provided with a scraper at the location of the first rotatable element, the free end of which scraper extends up to the wall of the container.

14. An apparatus according to claim 13, wherein said scraper is mounted under the first rotatable element.

15. An apparatus according to any one of the preceding claims, wherein two or more rotatable elements are provided, which elements are arranged in partially overlapping or in side-by-side relationship, with one or more discs being incorporated in the mixing blade.

16. An apparatus according to any one of the preceding claims, wherein the mixing element comprises at least one mixing arm or second mixing blade, which is provided with an element which is rotatably supported on the mixing arm or the mixing blade and part of the circumferential edge of which forms the front edge and the outer edge of the mixing arm or the mixing blade.

17. An apparatus according to claim 16, wherein the second mixing blade has a length of at least 180°.

18. An apparatus according to any one of the preceding claims, wherein the radial dimension of one or more rotatable elements amounts to at least half the radial dimension of the mixing blade at the location of the rotatable element, preferably it is substantially the same as the radial dimension of the mixing blade.

19. An apparatus according to any one of the preceding claims, wherein two or more mixing elements provided with rotatable elements are disposed in the container, wherein the paths that the rotatable elements of the various mixing elements describe partially overlap during rotation of the mixing elements.

20. An apparatus according to any one of the preceding claims, provided with means for decelerating or stopping the rotatable elements.

21. A mixing element comprising an upright column and a mixing blade having a front edge and an outer edge, which is attached to the column, characterized in that the mixing blade is provided with an element which is rotatably supported on the mixing blade.

22. A mixing element according to claim 21, wherein the rotatable element is disposed in the lower half, preferably in the lower third part, of the mixing blade, more in particular at the beginning of the mixing blade near the bottom of the container, with part of the circumferential edge forming the front edge and the part of the outer edge of the mixing blade that joins said front edge.

23. A mixing element according to claim 21 or 22, wherein the mixing element is provided with a second mixing blade comprising a rotatably supported element.

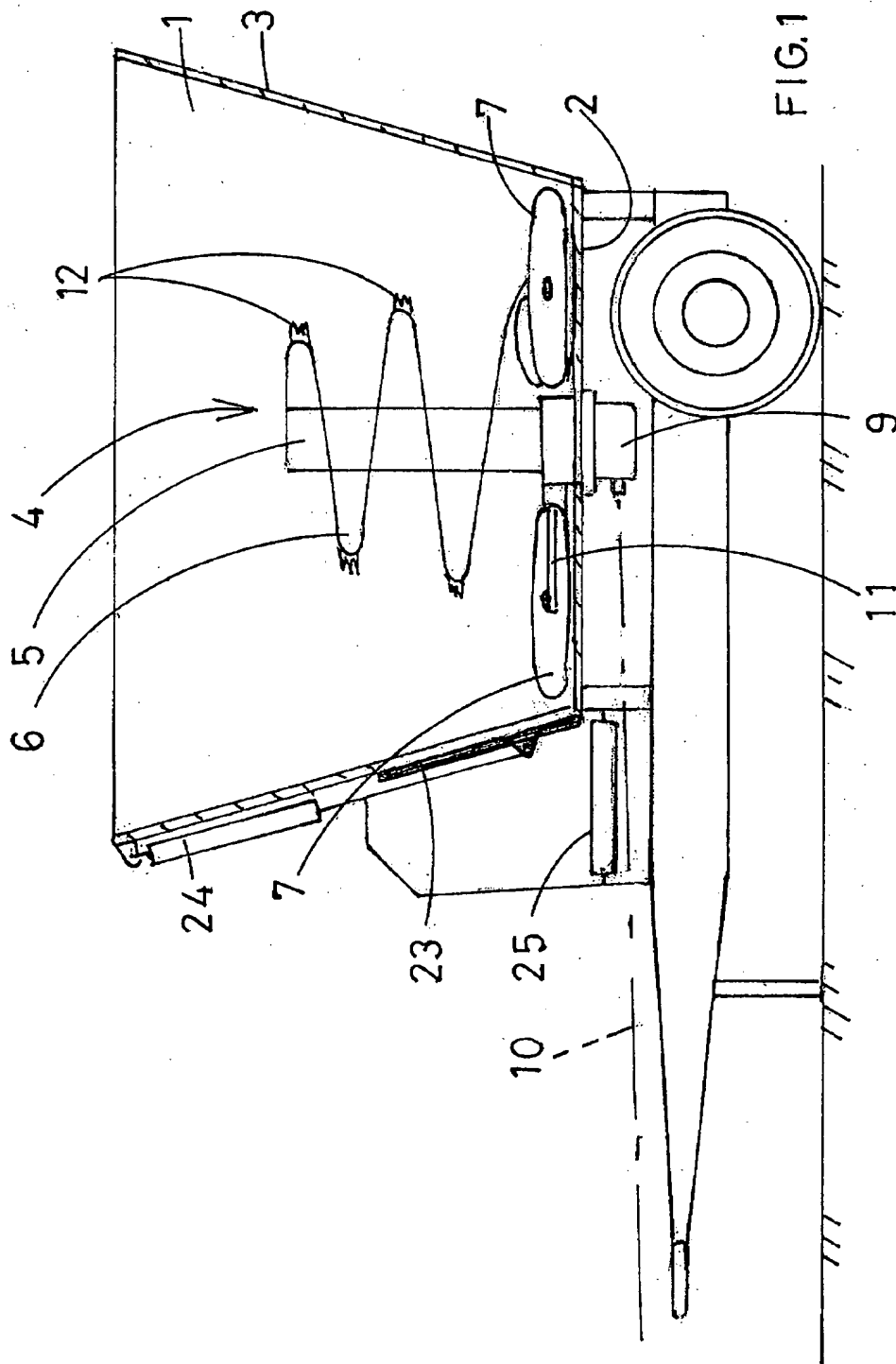
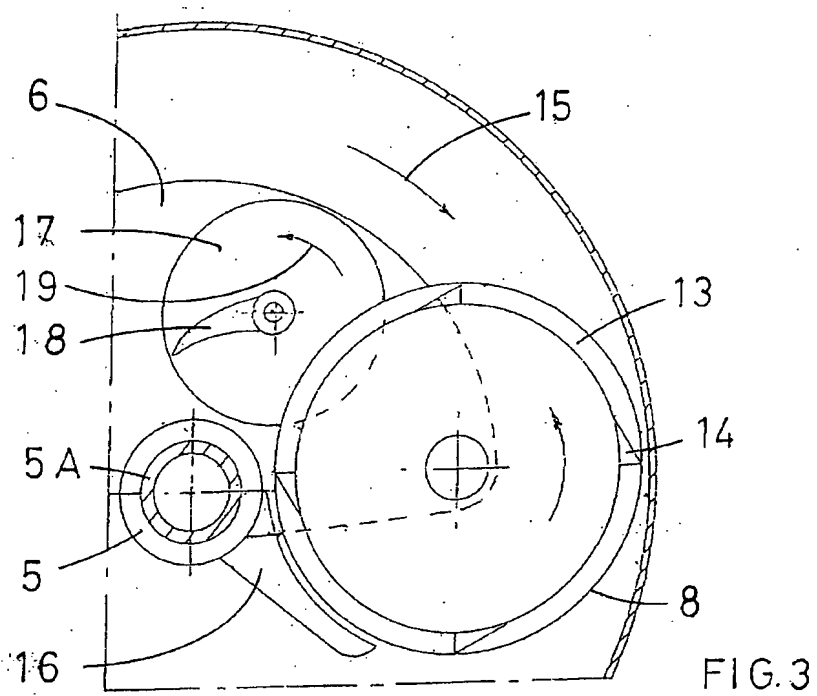
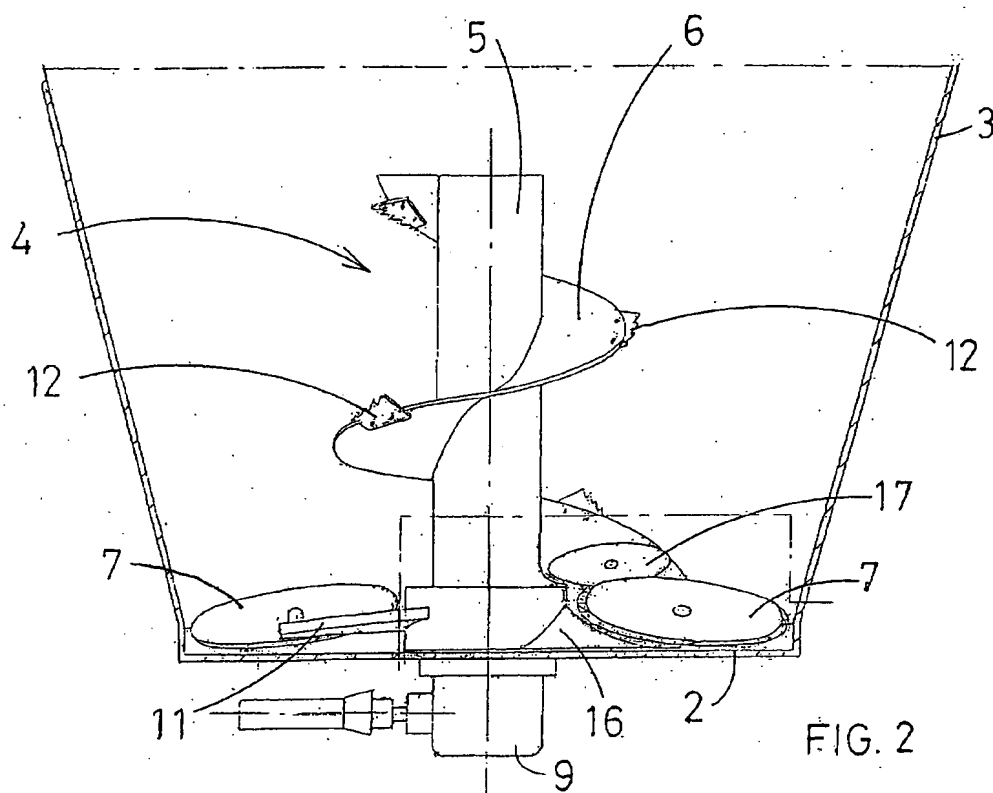


FIG. 1



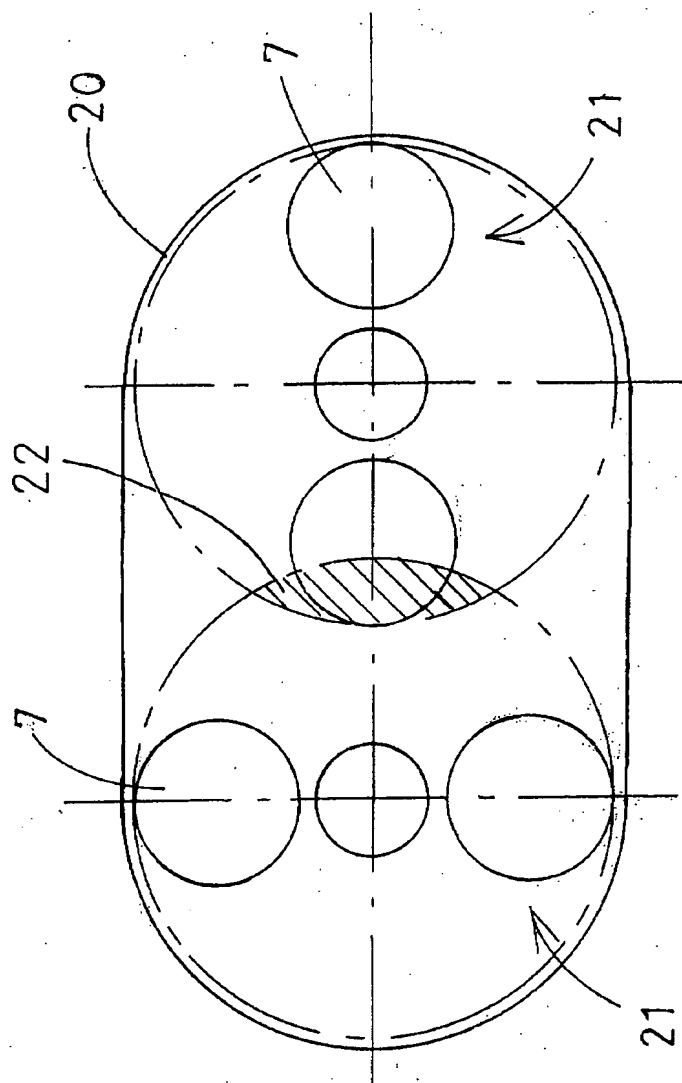


FIG. 4

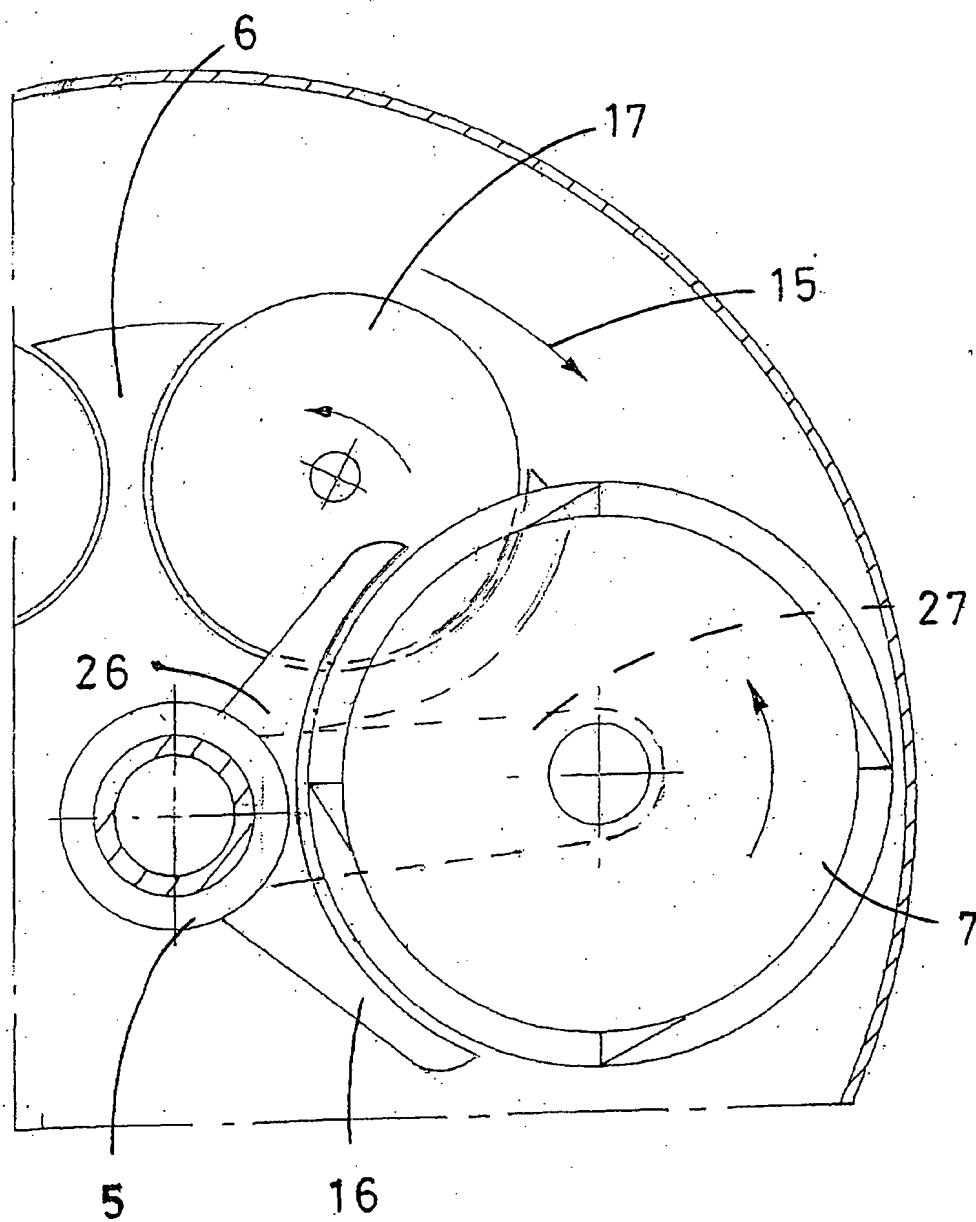


FIG. 5



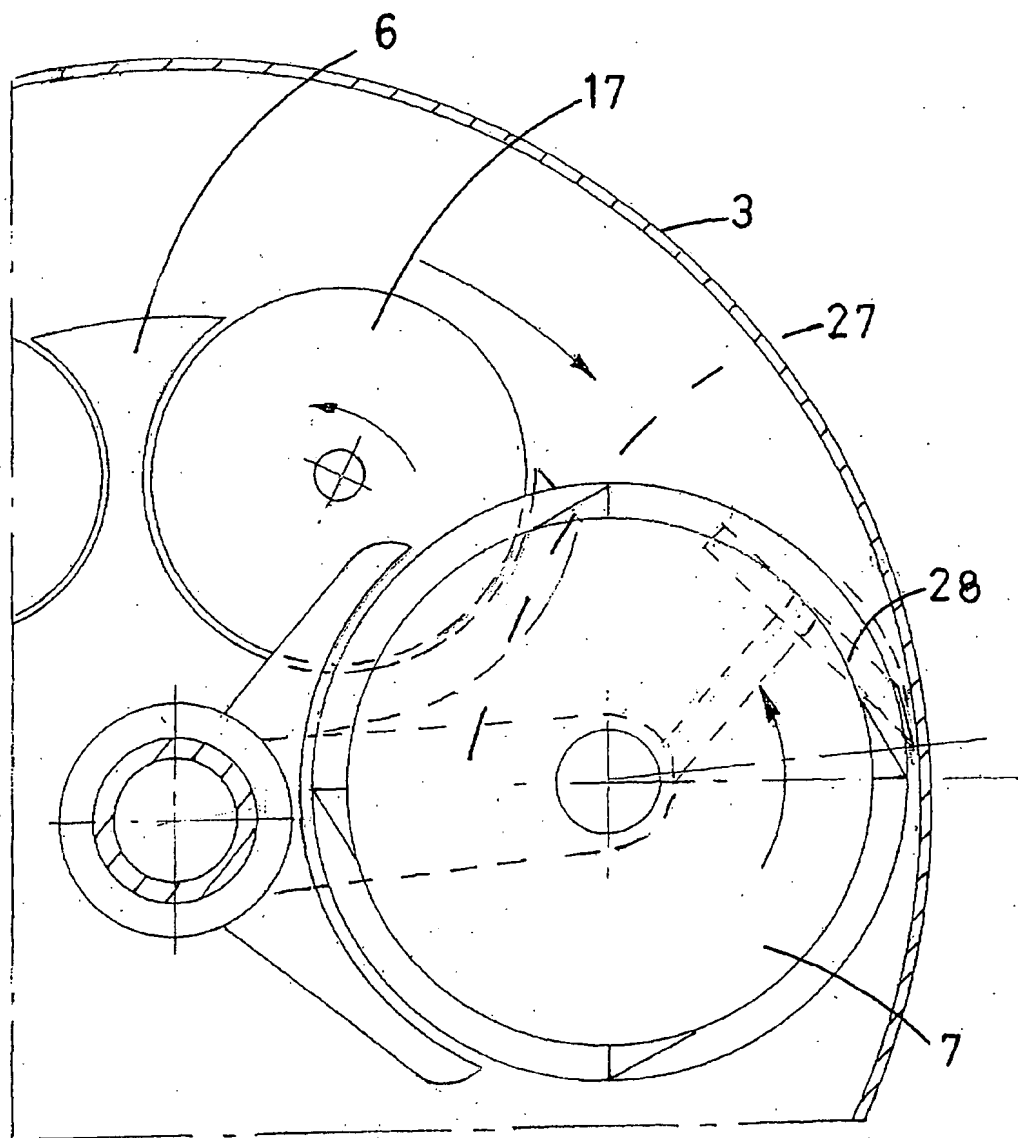


FIG. 6

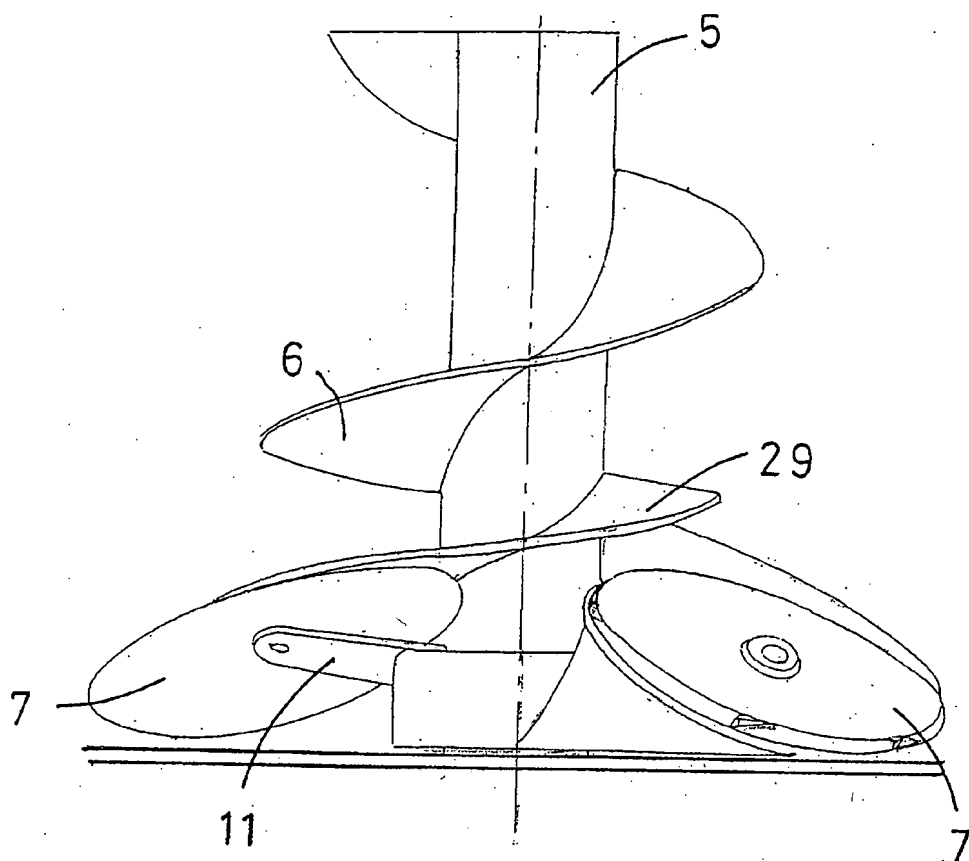


FIG. 7

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/NL2007/050015

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. A01K5/00 B01F7/24		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) A01K A01F B01F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 082 896 A (LOPPOLI) 14 March 2001 (2001-03-14)	1,2,4, 6-8,21, 22
A	paragraph [0023]; figures 1,4	3,5,15, 18
X	EP 0 943 236 A (TRIOLIET MULLOS B.V) 22 September 1999 (1999-09-22) cited in the application	1,2,21, 22
A	paragraph [0055]; figures 27,28	3-5
X	EP 1 417 999 A (HUGHES) 12 May 2004 (2004-05-12) paragraph [0048]; figures 12,13	1,2,4, 12,21
X	EP 1 224 859 A (B. STRAUTMANN & SÖHNE GMBH & CO) 24 July 2002 (2002-07-24) the whole document	1,2,4,21
-/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <span style="margin-left: 100px;"><input checked="" type="checkbox"/> See patent family annex.</span>		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents :</p> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>*G* document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search  <div style="text-align: center;">13 April 2007</div>		Date of mailing of the international search report  <div style="text-align: center;">20/04/2007</div>
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer  <div style="text-align: center;">von Arx, Vik</div>

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/NL2007/050015

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	FR 2 810 197 A (AFRAM) 21 December 2001 (2001-12-21) page 6, lines 8-29 page 9, lines 22-38; figures 1-4 -----	1,2,5, 12,21 3,22
X	NL 1 014 571 C (WORLD IDEA B.V.) 10 September 2001 (2001-09-10) the whole document -----	1,12,21
A	DE 299 11 066 U (MAYER) 14 December 2000 (2000-12-14) abstract; figures 1-3 -----	16,17,23
A	DE 203 05 983 U (B. STRAUTMANN & SÖHNE GMBH U. CO) 5 June 2003 (2003-06-05) abstract; figure 1 -----	19

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/NL2007/050015

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1082896	A	14-03-2001	IT	VI990076 U1	09-03-2001
EP 0943236	A	22-09-1999	EP	1188369 A2	20-03-2002
EP 1417999	A	12-05-2004	NONE		
EP 1224859	A	24-07-2002	DK	1224859 T3	09-08-2004
FR 2810197	A	21-12-2001	NONE		
NL 1014571	C	10-09-2001	NONE		
DE 29911066	U	14-12-2000	NONE		
DE 20305983	U	05-06-2003	NONE		

Form PCT/ISA/210 (patent family annex) (April 2005)